



A student performs an experiment to measure ϵ_0 , the permittivity of free space. The apparatus used consists of a spring with an unstretched length of $L_0 = 10.0$ cm that is hung from a ring stand. Ball 1, with a mass of 50 g, is then hung from the spring and allowed to come to rest at its equilibrium position. The length L of the spring is measured at this equilibrium position and found to be 10.5 cm. A charge of 30 nC is placed on Ball 1 and a charge of $6 \mu\text{C}$ is placed on a second ball, Ball 2. Ball 2 is then placed at various distances R from Ball 1 and the length of the spring is measured for each equilibrium position of Ball 1. The data the student collected is displayed in the chart below.

R (cm)	L (cm)		
2.0	14.6		
2.5	13.1		
3.0	12.3		
3.5	11.8		
4.0	11.5		

- 1) What is the value of the force constant k for the spring in this experiment?

